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(54) A hitch mounted electric towing unit

(57) A hitch mounted electric towing unit comprises a hitch locking system (1) for locking into the standard towing hitch of a trailer or caravan, the means of propulsion, e.g. a battery (5) which provides the power to drive an electric motor (3) which in turn is connected to a gearbox (4) onto which are mounted the pneumatic wheels (6) or tracks (37, fig 6).

The speed (1/2 mph max) and direction (e.g. forward/reverse) is controlled by twistgrips (48, fig 10) on either ends of the handle assembly (9) which are moved by the operator to right or left to steer the unit. This pedestrian controlled vehicle is designed to aid the physical effort needed to manoeuvre uncoupled trailers.

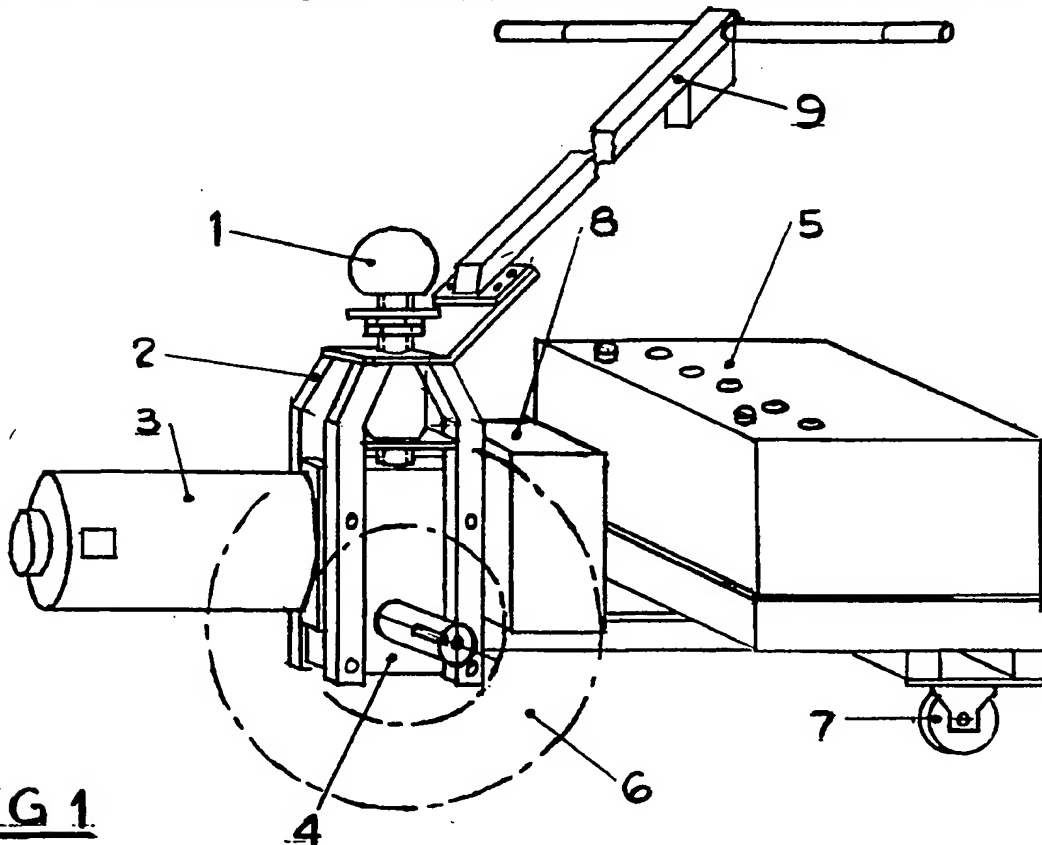


FIG 1.

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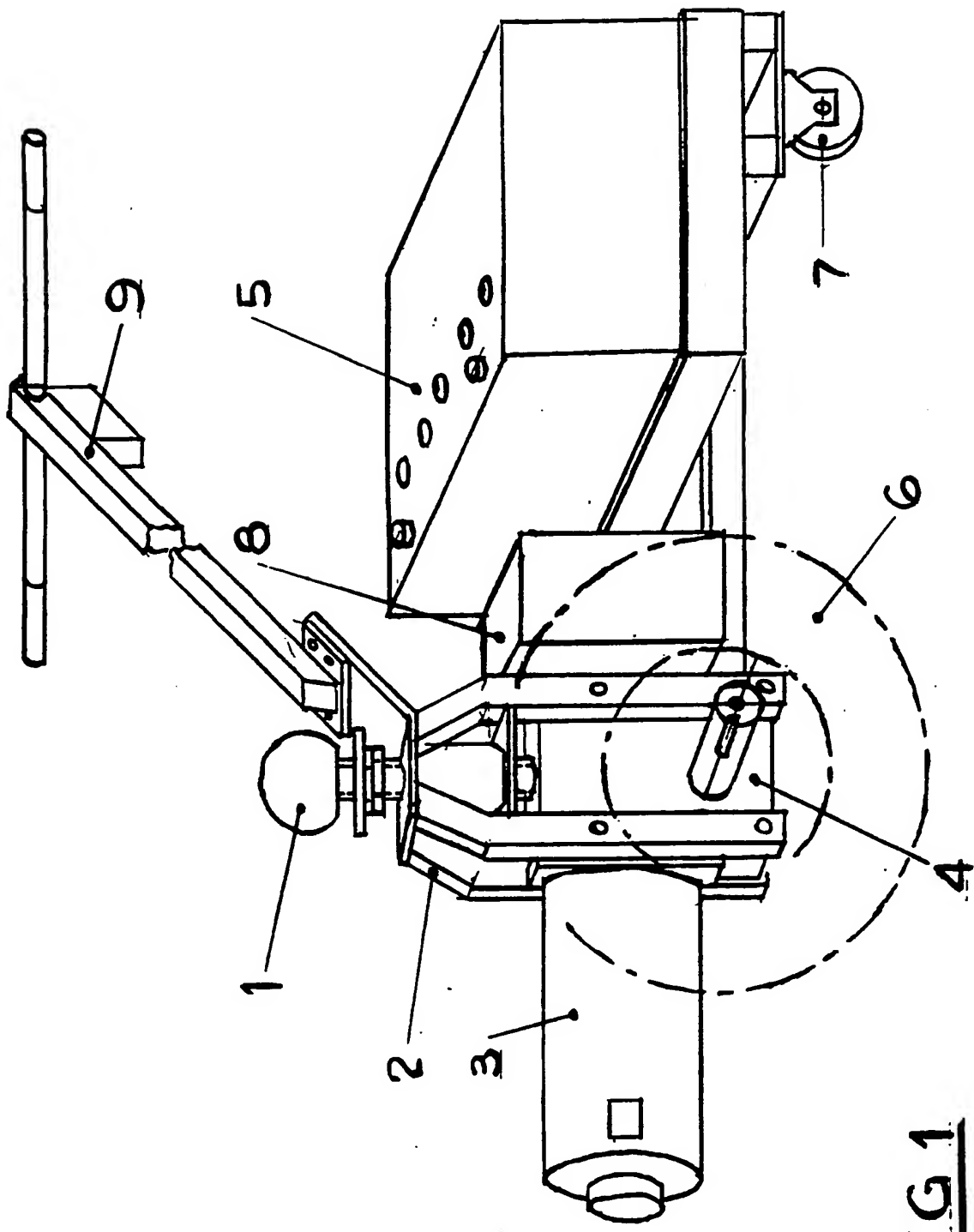


FIG 1

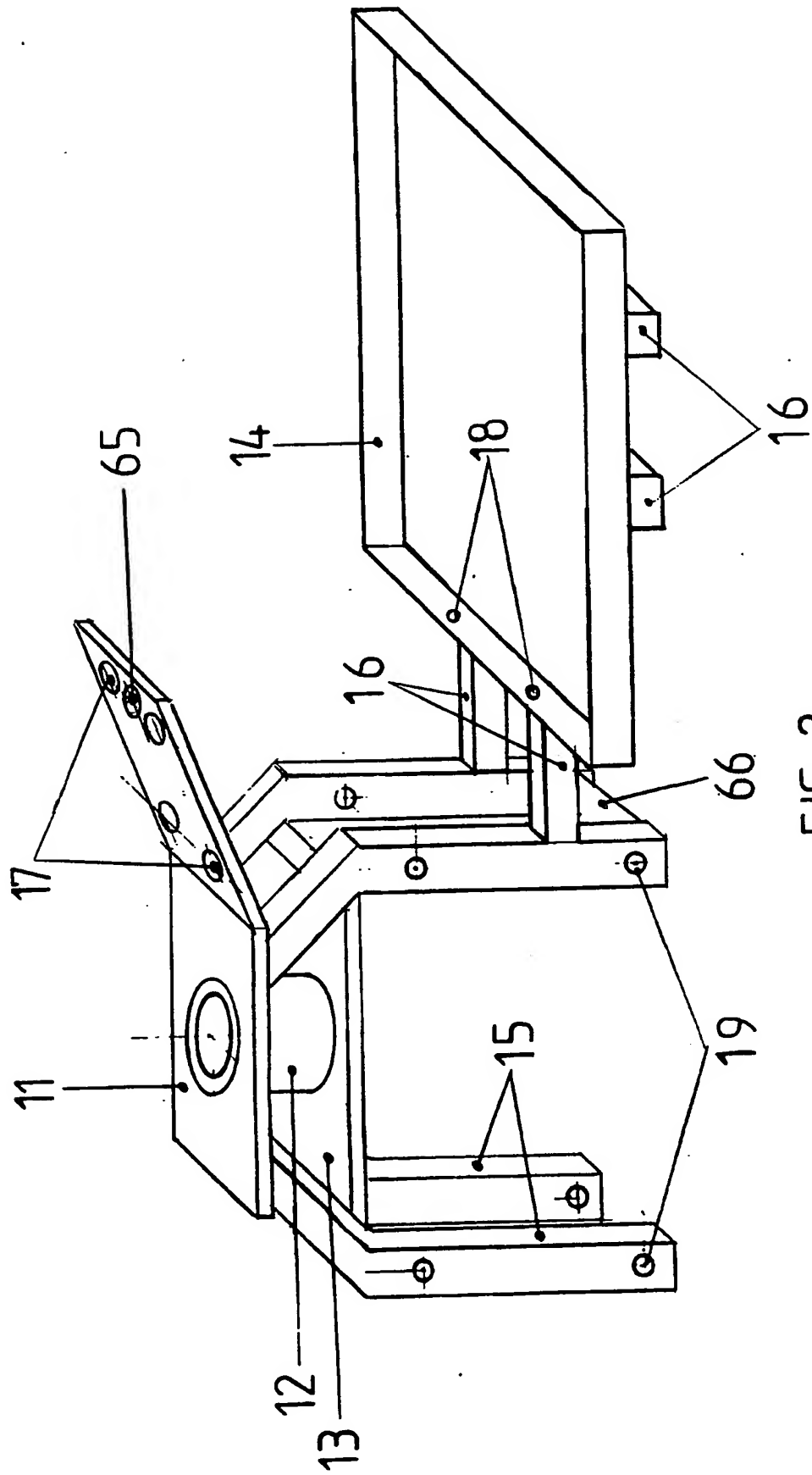


FIG. 2

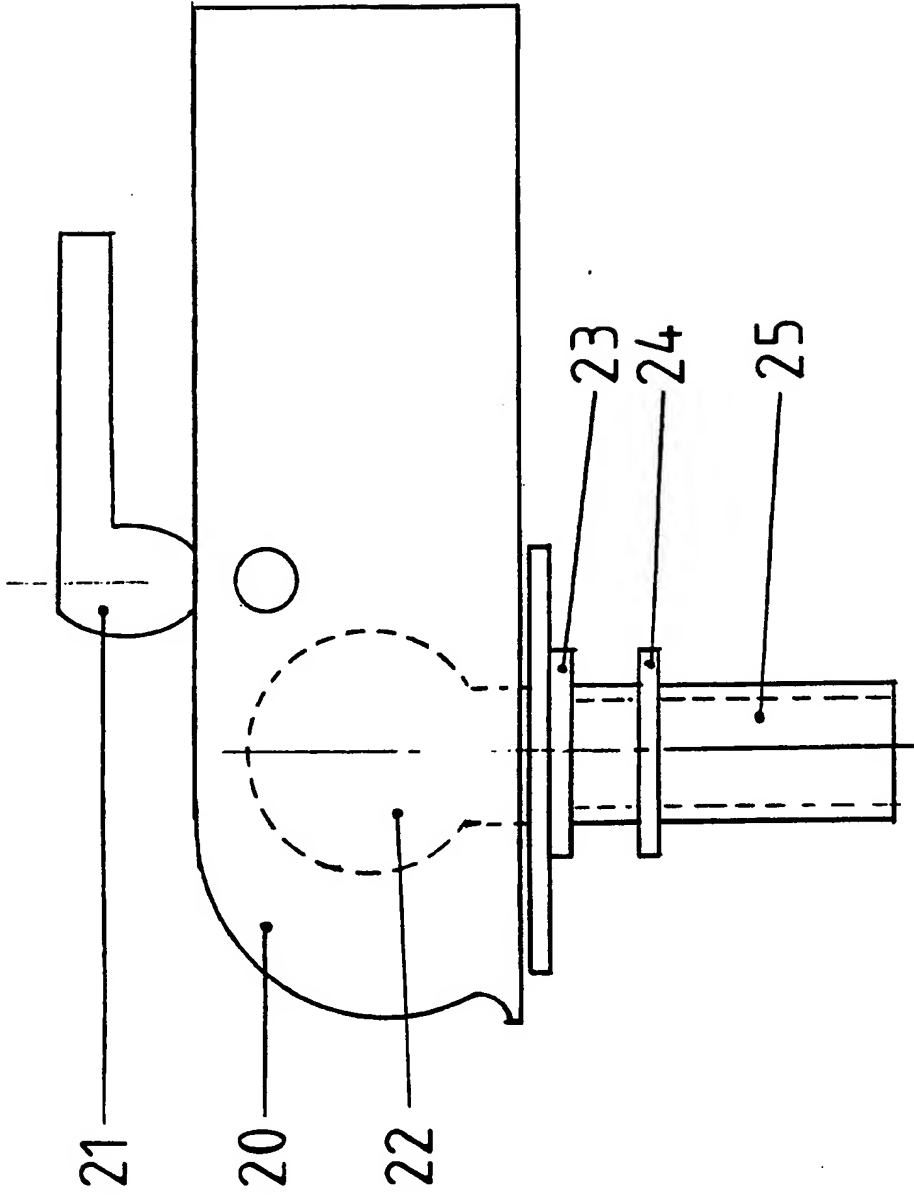


FIG. 3.

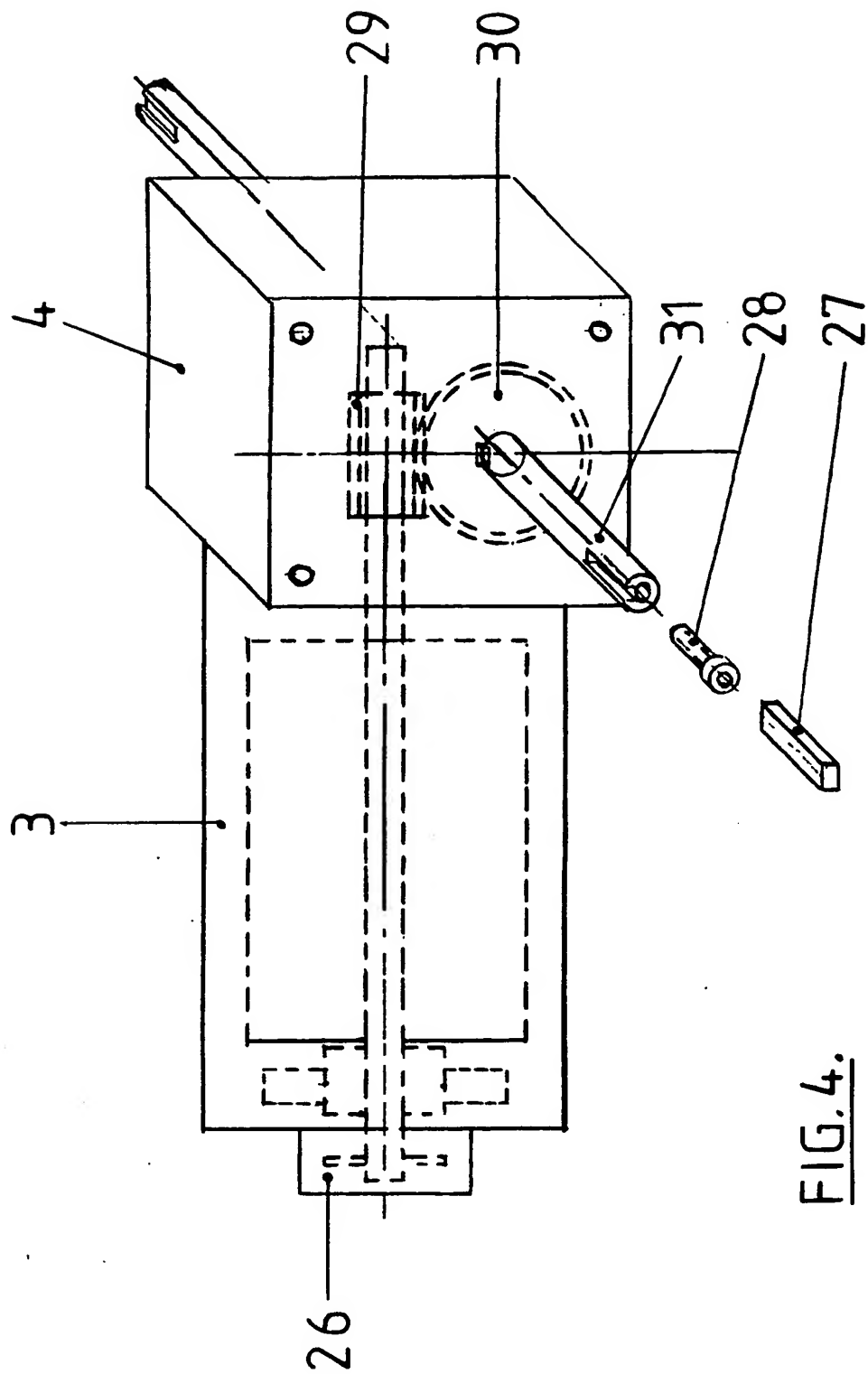


FIG. 4.

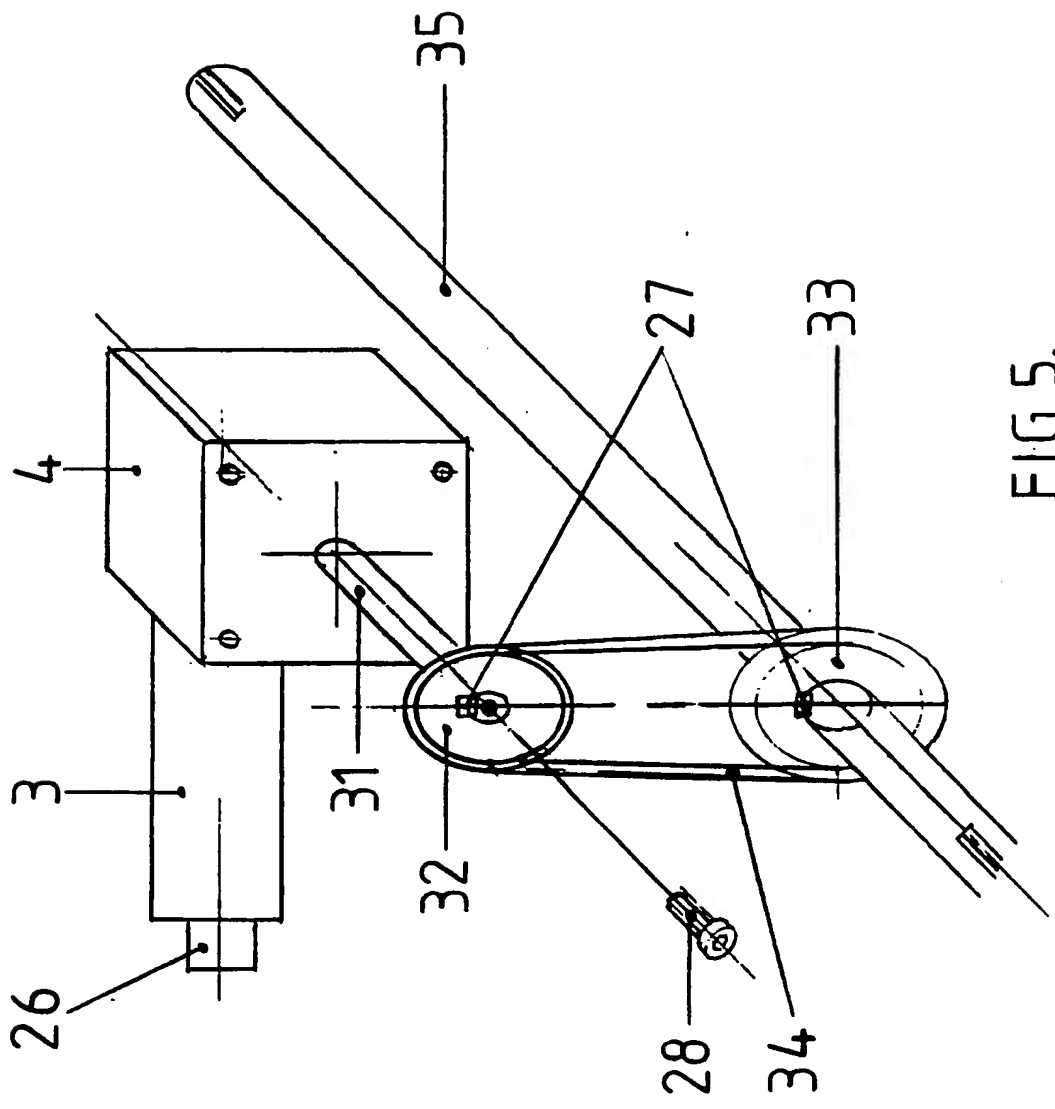


FIG. 5.

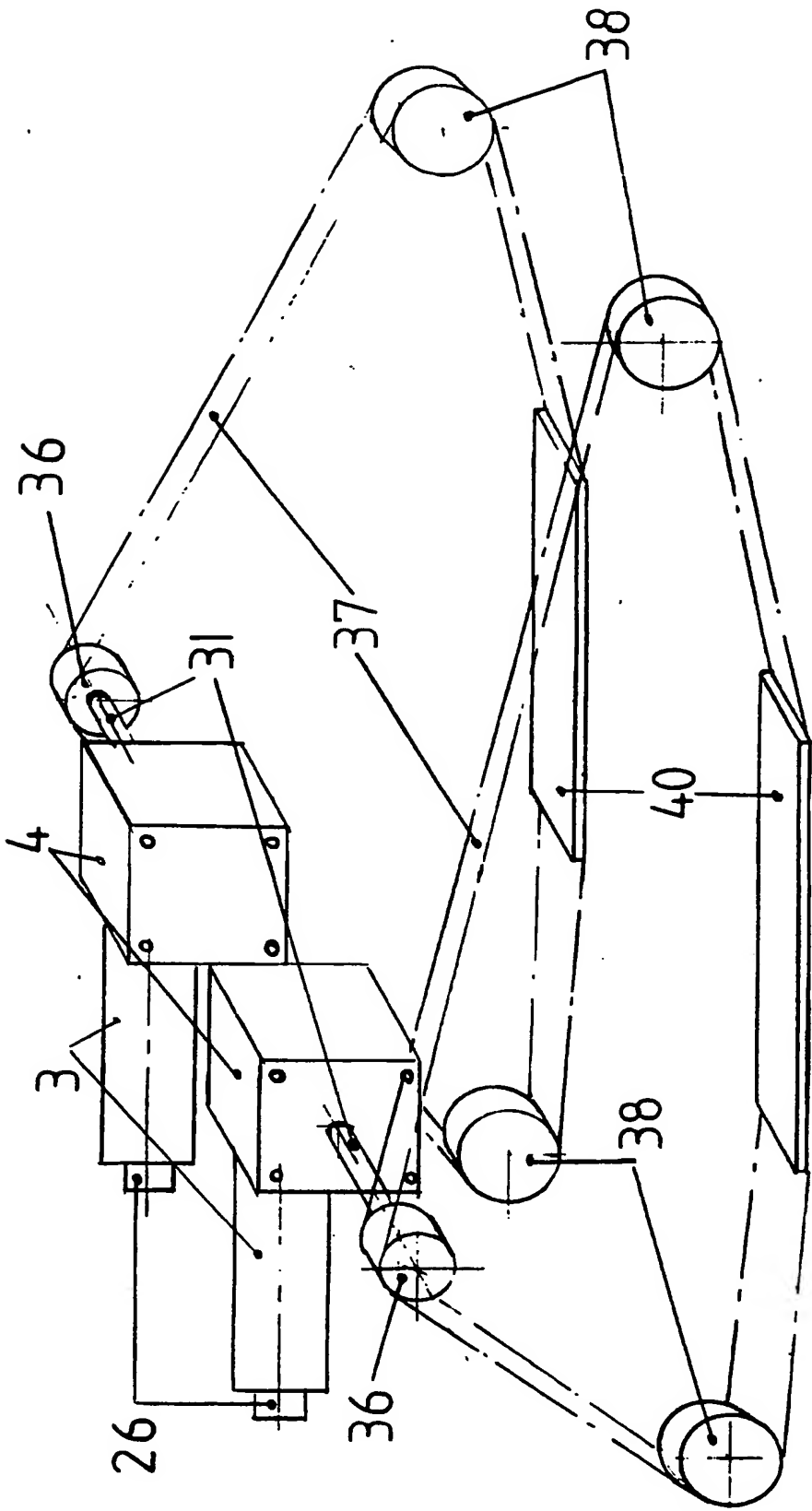


FIG. 6.

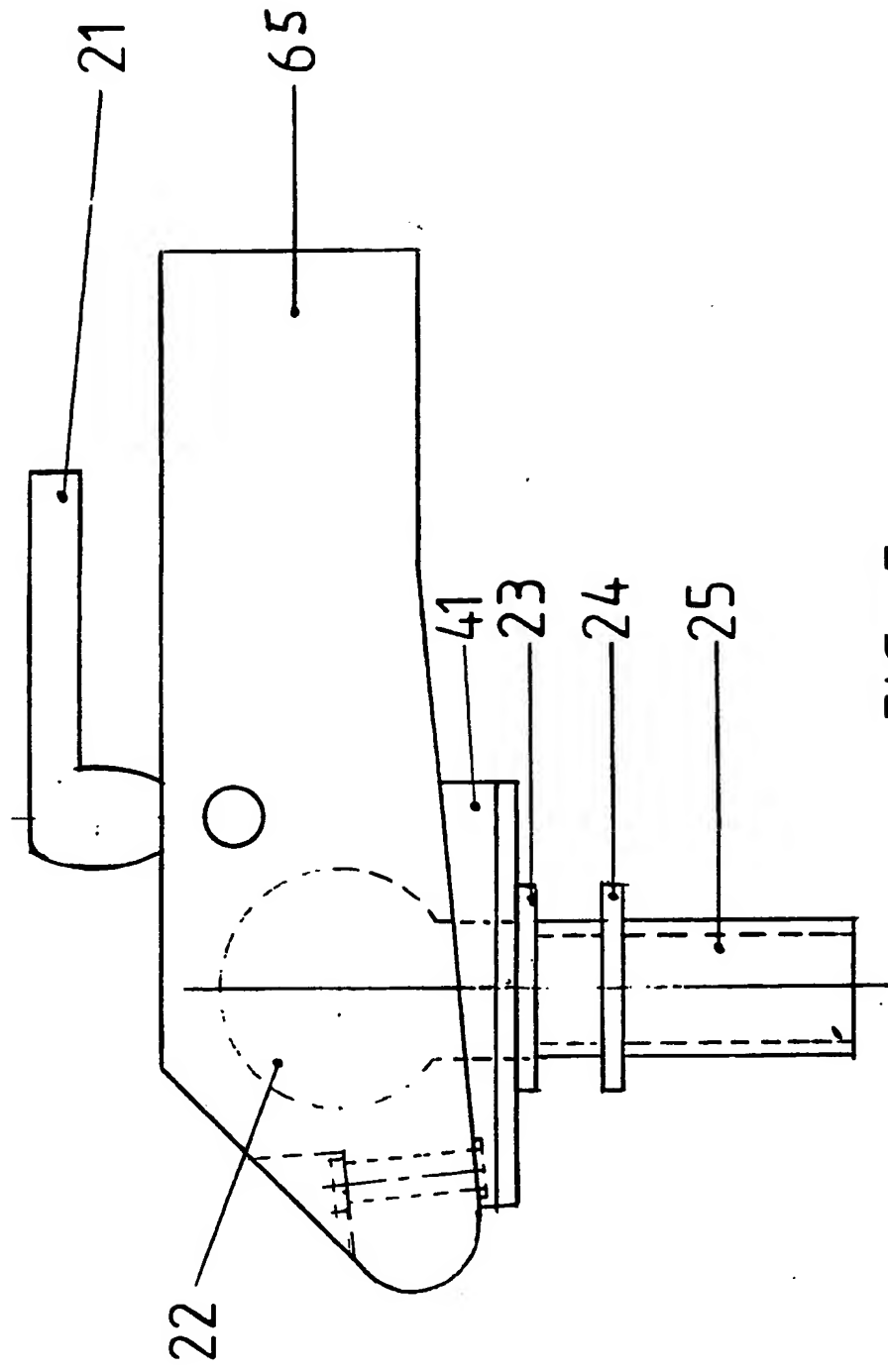


FIG. 7.

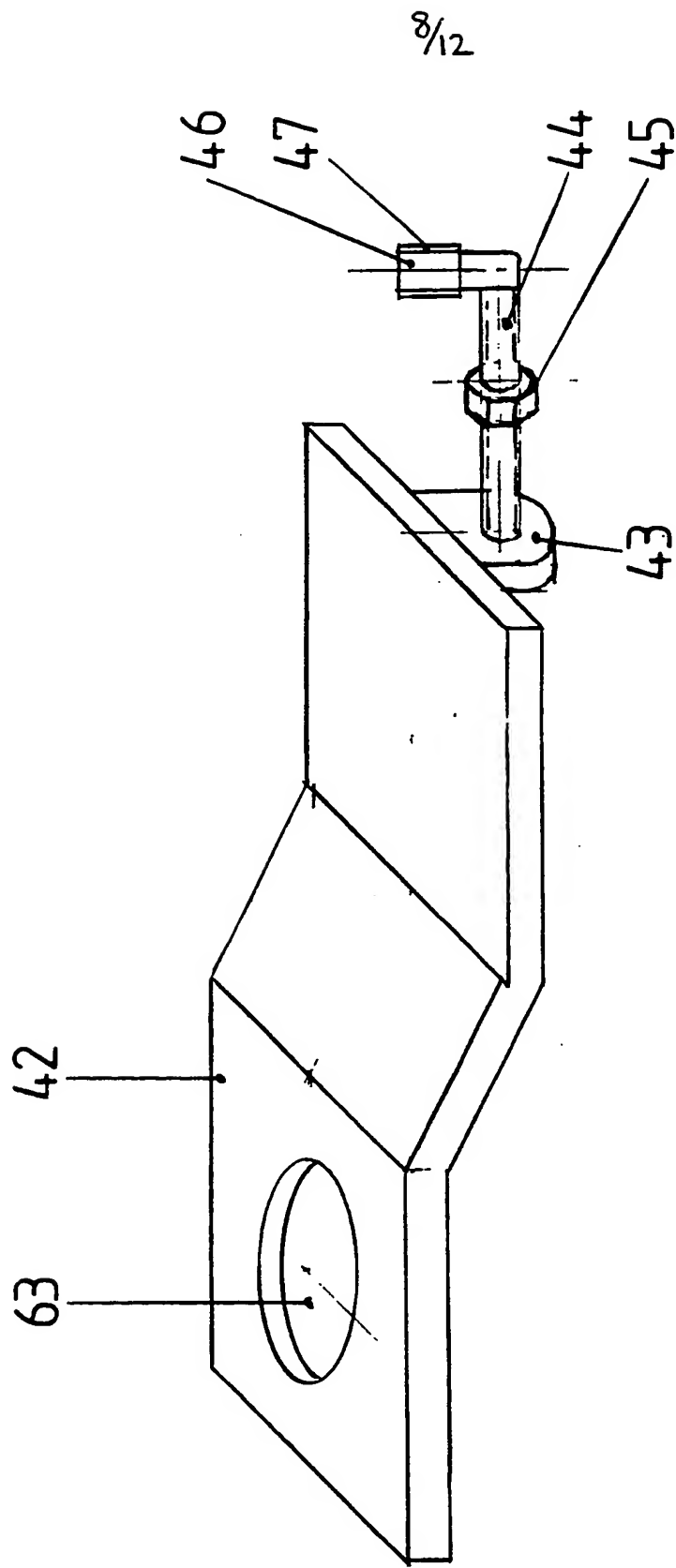


FIG. 8.

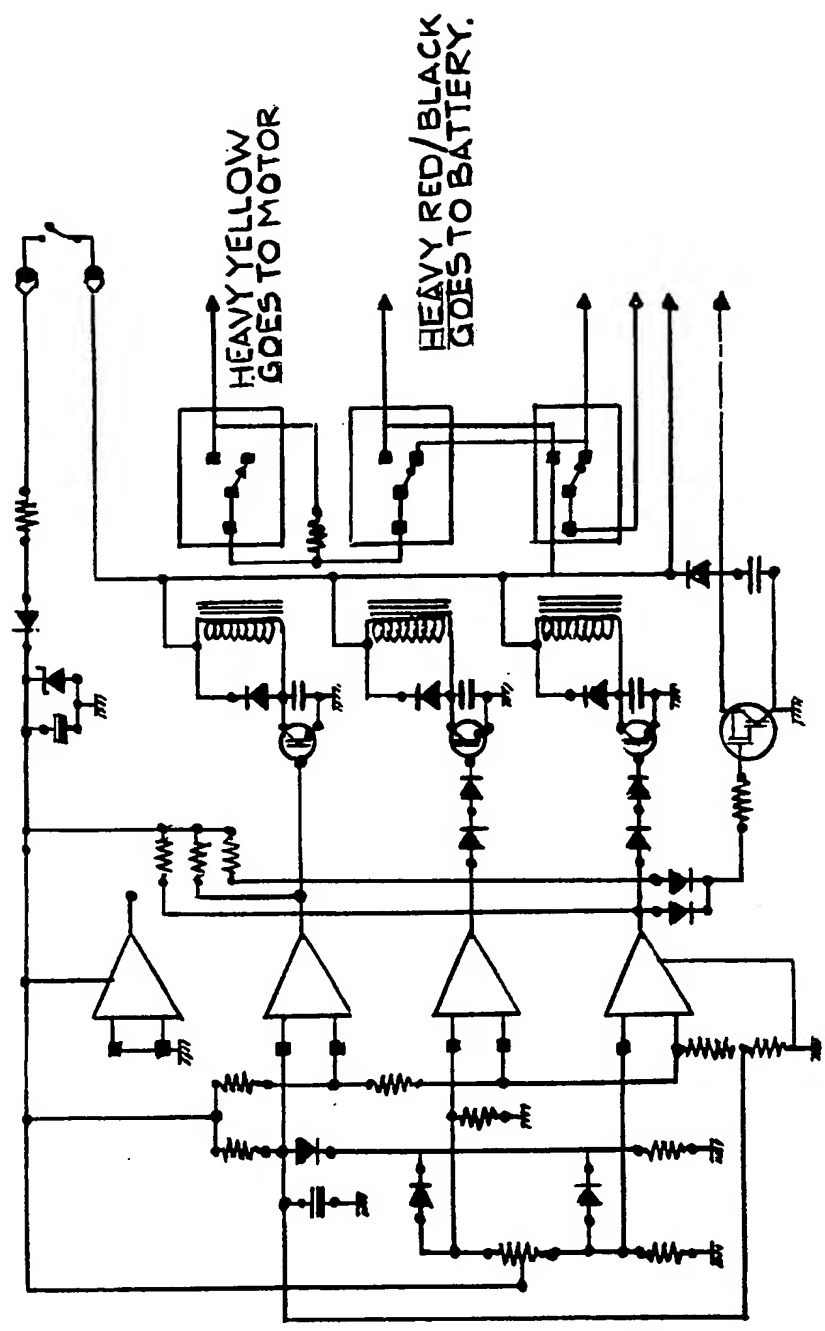
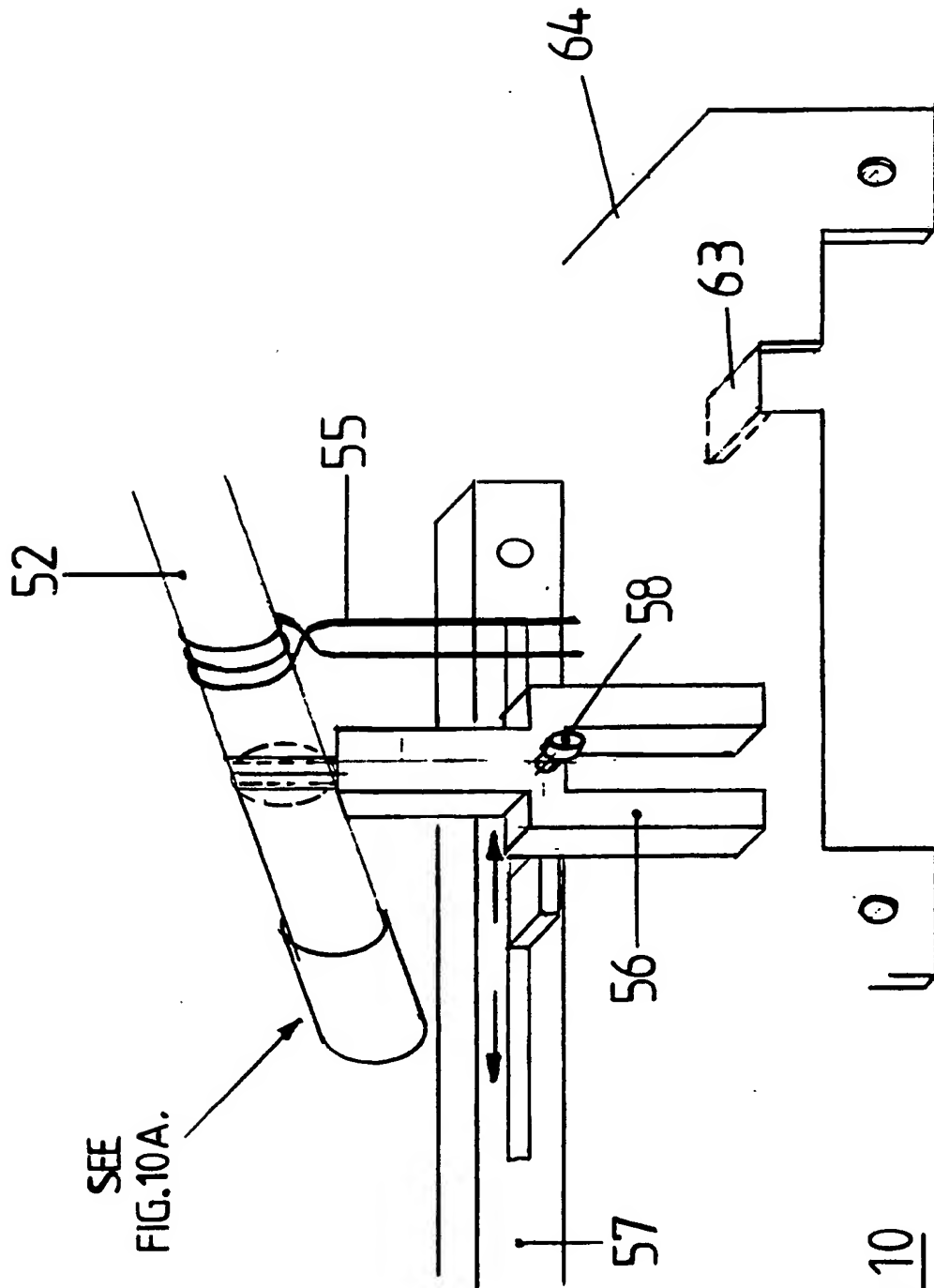


FIG.9 MOTOR CONTROL CIRCUIT.



SEE
FIG. 10A.

FIG 10

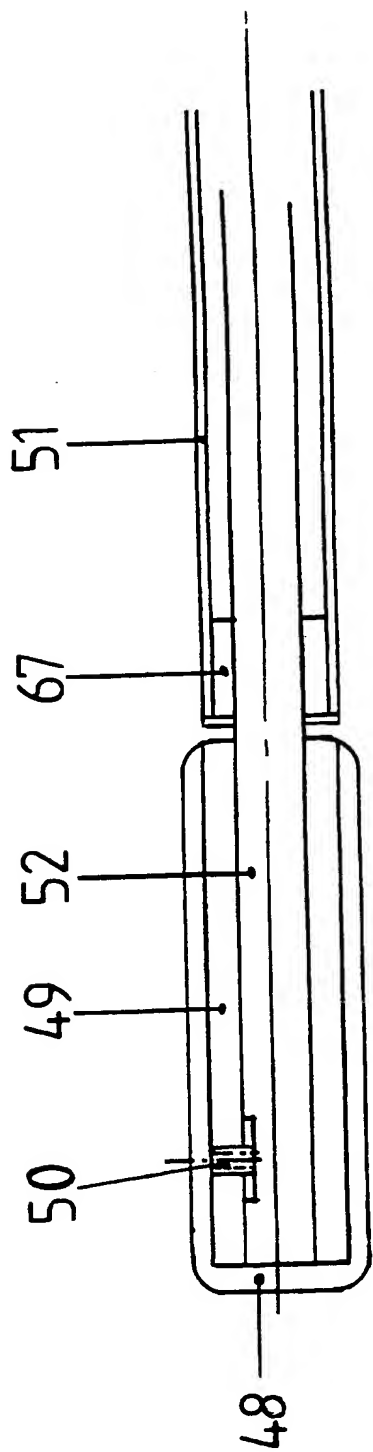


FIG 10A

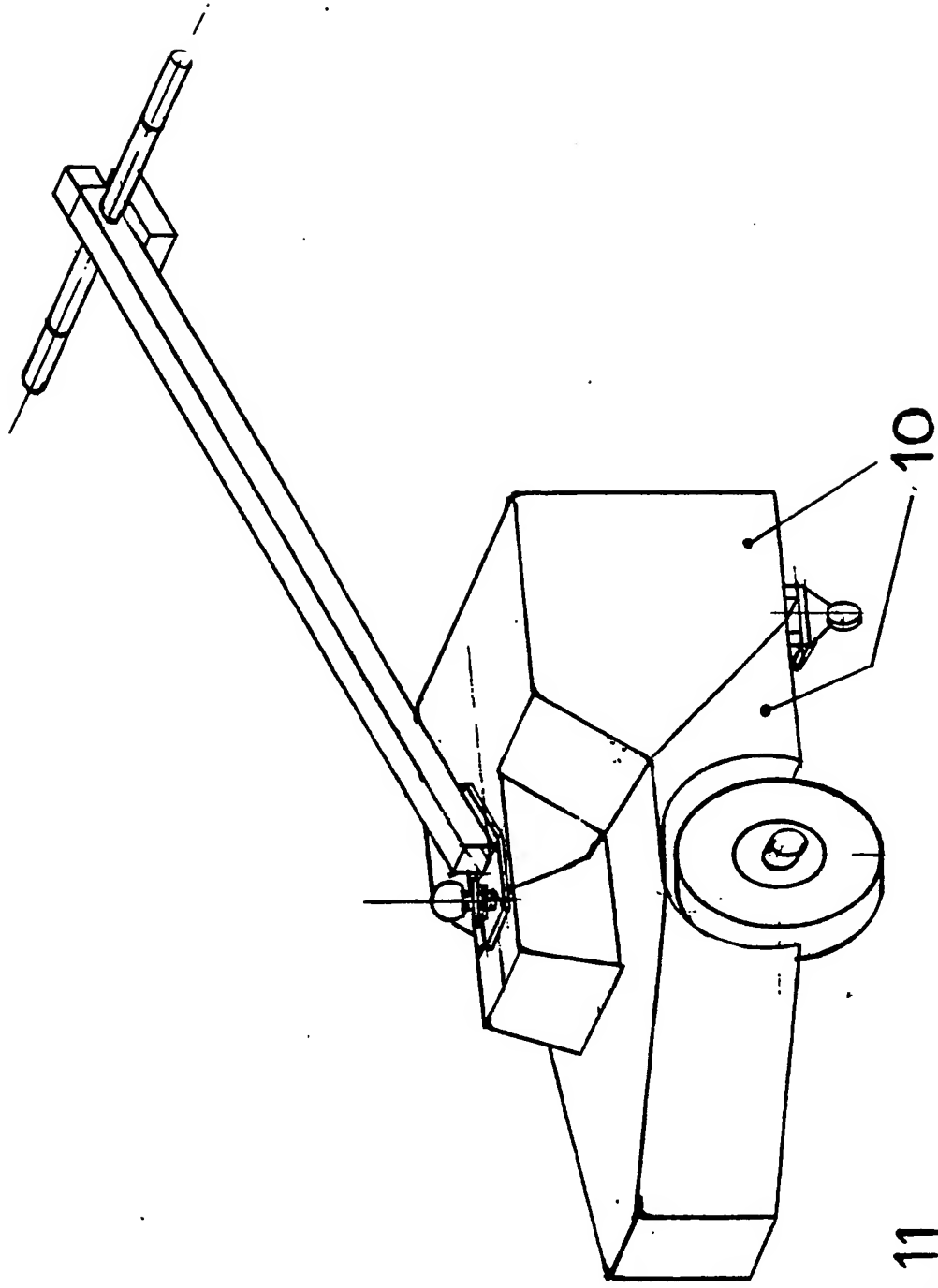


FIG 11

PAGE 1

A HITCH MOUNTED ELECTRIC TOWING UNIT

This invention relates to hand operated, electrically powered, units for the handling of wheeled trailers.

Most trailers and caravans utilise a recognized chassis supported by road wheels and a jockey wheel to allow some manoeuvring facility when uncoupled from its towing vehicle. Any movement of the trailer requires considerable effort by the user, particularly with twin axle trailers. The single jockey wheel is of little help as it has no brake and sinks into soft ground. Motorised jockey wheels suffer from the same problems although some do incorporate a brake.

It is the intention of this invention to enable the user to manouvre a trailer, with electrical assistance, using minimum physical effort and using the traction provided by the weight of the unit itself via twin pneumatic tyres or tracks to ensure maximum grip on the ground by utilising the trailer hitch as a mounting point.

According to one aspect of this invention, there is provided a chassis and handle, preferably of tubular steel construction, and a battery tray mounted at the rear of the chassis.

The chassis is surmounted by a 50mm diameter ball which is fixed to the top of a threaded spindle which in turn screws into a similarly threaded boss built into the upper chassis. This allows for a height adjustment according to the hitch height of the trailer being moved. On the spindle is a locking disc, this locking disc has a nut welded to its underside to enable it to be adjusted up tightly against the bottom face of the hitch when attached to the trailer. This locking system ensures that the unit is securely attached to the trailer. Below the locking plate is a lock nut to ensure upon removal and replacement of the hitch that re-adjustment is not necessary.

The chassis sits on pneumatic tyred wheels, preferably one on each side, driven by an axle which passes through a worm drive gearbox. The ratio of the gearbox will probably be 60-1. The gearbox is mounted in the chassis. The motive power is supplied preferably by a 12 or 24 volt electric motor, or motors, which drive through a single or maybe two worm drive gearboxes and each motor incorporates a disc brake, electrically controlled and applied automatically as the hand controls are returned to the neutral position.

The motor will preferably be controlled by a series of relays and a fixed resistance to create a stepped start effect to enhance the traction required. The current to be switched on and off by a switch at the top of the handle and the forward/reverse controls to be via twistgrip handles to be incorporated in the handlebars. The supply of electricity will probably be a semi-traction battery of 12 or 24volt and capable of producing 90 amps for several minutes under full load.

The battery is mounted on the chassis under the handle and the rear of the chassis is supported by two swivelling castors for handling when not attached to the trailer. The whole lower section of the unit is covered by a vacuum formed cover for protection against poor weather conditions. The unit is steered by the user moving the handlebars to the right or left causing the unit to revolve on the threaded spindle secured in the hitch and applying the twistgrip controls for either forward or reverse motion.

According to another aspect of this invention there is provided a further chain or belt drive between the gearbox and the drive axle which can reduce the speed of the wheels by a ratio between 2-1 and 4-1 but probably 3-1.

A further aspect of this invention is provided by the provision of tracks in place of pneumatic wheels, these probably used in conjunction with a double motor drive.

According to another aspect of this invention there is provided a collar which fits in between the locking disc and the lower face of any hitch which does not have a flat underside to ensure a snug fit of the unit. This collar to have its upper face so made to match any lower hitch face irregularities.

Yet another aspect of this invention is the provision of a bracket to fit between the locking disc and the locknut which when placed against the front face of the trailer chassis will prevent the trailer brakes being inadvertently applied when moving in reverse. This bracket has an adjustment to allow for chassis of differing makes and styles.

A specific embodiment of the invention is described in the following example giving references to the accompanying drawings.

DRAWINGS LIST

Figure 1 Shows, in perspective, a hitch mounted electric towing unit according to one aspect of the invention without covers.

Figure 2 Shows the chassis details.

Figure 3 Shows the hitch locking system details.

Figure 4 Shows the gearbox and motor details in schematic form

Figure 5 Shows additional gearing option in schematic form

Figure 6 shows the tracked option details

Figure 7 is the adaptor collar to suit all models

Figure 8 is the reverse brake bracket to suit all models

Figure 9 is the control circuit details

Figure 10 Shows the handle controls details

Figure 10a Shows the handlebar end twistgrip details.

Figure 11 Shows the unit complete with covers in place.

Referring to figure 1, a hitch mounted electric towing unit is illustrated. The unit consists of a hitch locking system (1) (see fig.3), a chassis (2) a gearbox(4) and motor (3)(see fig.4,) a battery 5, wheels 6, castors 7, a control box 8,(see fig.9) and handlebar assembly, 9.(see fig.10 & 10a).

The motor complete with its gearbox is located in the chassis and secured with four bolts and nuts(M8 X 110mm). The wheels(6) are fitted to the gearbox output shafts (31) using the locking keys (27) and the socket screws (28) into the ends of the shafts. The hitch locking assembly (1) is screwed into the threaded boss (12) in the upper chassis.

The control box (8) is located at the rear of the battery tray (14) The handle assembly (9) is mounted on the top plate (11) with four screws (28).

The battery (5) is fitted on the battery tray (14) and connected to the control box (8). The wiring is connected between the control box (8) and the wiring loom (62) exiting the bottom end of the handlebar assembly (9). The forward/reverse, the on/off and the brake wires are all connected to a terminal block on top of the control box (8). The wires to the motor (3) are fitted to the positive/negative terminals on the motor.

The front cover (10) is fixed to the chassis using two self tapping screws. The rear section of the cover (10) clips into place for access to the battery (5).

Referring to Figure 2, The chassis (2) is of steel tubular section with a top plate (11) and a lower plate (13) both supporting a threaded boss (12) in a vertical position. The rearward extending and cross tubes (16) support the battery tray (14) and the castors (7) are welded to the chassis under the battery tray (14) one on each corner. The eight holes in the chassis are to mount the motor/gearbox assembly (3/4) and the four holes (17) in the top plate (11) are to attach the handle assembly (9).

The two holes (18) in the front edge of the battery tray are to mount the control box (8).

Referring to Figure 3, The hitch locking system (1) comprises a 50mm dia standard tow ball (22) welded to a threaded spindle (25) which carries a threaded locking disc (23) which revolves on the thread up to the bottom face of the hitch (20).

When the disc (23) is tightened up, using a suitable spanner, the ball (22) cannot move in the hitch (20), therefore holding the hitch mounted towing unit (1) in a vertical position ensuring that only the driven wheels (6) are in contact with the ground. This is as a result of the castors being mounted higher relative to the ground therefore tilting the unit backwards when at rest and not connected to the trailer hitch (20) The locknut (24) ensures no adjustment is necessary after each use.

Referring to Figure 4, The motor (3) preferably a 12/24volt D.C. motor with high copper content brushes, is fitted with a single disc brake (26) which is mounted at the rear end of the armature. The brake (26) is released by the supply of power from the control box (8) and remains locked at standstill even when the main on/off switch (53) is turned off. The motor (3) is supplied attached to the gearbox (4) which would be preferably a 60-1 ratio worm drive, the worm (29) being fixed to the armature of the motor (3) drives the gearwheel(30).

The gearbox output shaft (31) is keyed through the centre of the gearwheel (30) and is keyed at the ends to match the keyway slots in the driven wheels (6) Tapped holes in the ends of the gearbox output shaft (31) is to locate the wheel securing screws (28).

Referring to figure 5, a further aspect of this invention is the provision to reduce the gearing produced by the gearbox (see fig.4) to achieve greater torque. It may be that two sprockets or toothed pulleys of differing sizes would give a reduction of preferably 2-1. The small pulley/sprocket (32) fixed to the gearbox mainshaft (31) with the gearbox (3) in a new position and the addition of a new axle (35) for the drive wheels (6) this new axle to run in two self lubricating bearings mounted in the chassis (2) and carrying the larger pulley/sprocket (33) the two pulleys/sprockets to be connected via a toothed belt/simplex chain (34).

Referring to Figure 6, Using the means of power described in figure 4. it is provided for the unit to be fitted with two tracks(37), which may be driven by one motor/gearbox (3/4) each and passing over preferably two idler wheels (38) between which would be a spring supported platten(40). Such tracks may be of a linked construction or a double sided toothed belt.

Referring to Figure 7, The adaptor collar (41) fits under the ball (22) in the hitch locking assembly (1) and is made to match the underside face of the hitch (65) into which the hitch mounted electric towing unit is fitted. The bore is a clearance fit on the threaded spindle (25) therefore the collar (41) does not revolve as the locking disc (23) is tightened, thus ensuring precise positioning against the hitch (65). This allows the hitch release (21) to operate, thus releasing the ball locking assembly (1) from the hitch (65).

Referring to Figure 8, shows the reverse brake bracket which if necessary, fits between the locking disc (23) and the locknut (24). and comprises a metal bar (42) bent to shape and with a hole (63). at one end which is clearance on the threaded spindle (25). Welded under the opposite end is a nut (43) through which passes a similarly threaded bar (44). This bar is fitted with a locknut (45) and a right angled bar (46) welded to the end. This angled bar (46) to be fitted with a plastic tube (47). The function of the reverse brake bracket is to sit between the threaded spindle (25) and the front face of the 'A' frame of the trailer/caravan. The plastic tube (47) prevents damage to the 'A' frame face.

The reverse brake bracket is pushed against the 'A' frame as the hitch mounted electric unit is reversing the trailer thus negating any inadvertent operation of the trailer brakes due to maladjustment of the same.

The bar (44) can be adjusted and duly locked to suit any type of 'A' frame. Should it be desired to activate the brakes E.G on a slope then the reverse brake bracket can be swung out of contact with the 'A' frame thus allowing the automatic braking action to take place which is built into most trailer chassis.

Referring to Figure 9. which is the motor control circuit, The control box (8) carries a terminal block which connects the wiring from the control box (8) to the the handle assembly (9). Internally is mounted a printed circuit board which carries the three 12v 60 amp single pole relays which control the movements of the hitch mounted electric unit. The operation of the hitch mounted electric unit is controlled by, firstly, a rocker type on/off switch (53) mounted on the top of the handlebars (59) in the centre.

The operation of the switch (53) to the 'on' position activates the electrical circuit which in turn supplies current to the control box (8) via the twistgrip controls (see 10a) on the handlebars. The twistgrips (48) are turned by hand. When revolved away i.e. top surface going away from the user, the unit will move away from the user, thus moving the trailer in reverse. conversely if the twistgrips are revolved towards the user then the trailer will move forwards.

The neutral position of the twistgrips is found by the return spring (55) and acts as a 'dead mans' handle. The power to the brake (26) is cut off in the neutral position of the twistgrips thus applying the brake (26) to the motor (3) and locking the wheels (6) through the gearbox (4).

The controls incorporate a delay timer of two seconds between the first relay which through a bank of two resistors allows only preferably 30 amps to be fed to the motor (3) If the twistgrip (48) is held in the first 30% of the available movement then the power will remain at preferably 30amps thus providing a 'crawler speed'. If the twistgrips are turned fully round to the limit then after the delay period the full current provided by the battery (5) which may be 90amps, will be fed to the motor (3).

The variation of the current supplied to the control box (8) is via a 10k slider control (57) mounted in the box under the handlebars (9)(see fig.10).

Referring to Figures 10 and 10a, The handle assembly is the means of steering the unit and contains the electric controls to feed the users intentions to the control box (8) and subsequently the motor (3). The square tube section handle is secured to the unit by the four allen screws (28), the handlebars comprise two tubes each welded to the handle. The twistgrips (48) are mounted on each end of the handlebar cross spindle (52) and secured by the socket grub screws (50) onto the flats on the cross spindle (52) Self lubricating Nylatron bushes (67) carry the cross spindle (52) through the handlebars.

The tapped hole in the centre of the cross spindle (52) carries the slider activating fork (56). The centralising spring (55) is located over the cross spindle (52) and the ends protrude down into the plastic slider box (68) (see fig 1). the countersunk screw in the slider activating fork (56) acts against the spring (55) to return it to the centre position. The slider lever is located between the legs of the activating fork (56). As the twistgrips are revolved this turns the cross spindle (52) thus moving the fork (56) in an arc which slides the slider lever to one extent or the other, the central position being standstill.

DRAWINGS KEY PAGE 1 OF 3

HITCH MOUNTED TOWING UNIT FIG. 1

hitch locking system	=1
chassis	=2
motor	=3
gearbox	=4
battery	=5
wheels (2)	=6
swivelling castors (2)	=7
control box	=8
handlebar assembly	=9

CHASSIS DETAILS FIG. 2

chassis top plate	=11
threaded boss	=12
lower plate	=13
battery tray	=14
chassis legs (4)	=15
battery tray support rails (4)	=16
m8 tapped holes (4)	=17
control box mounting holes (4)	=18
motor/gearbox mounting holes (8)	=19

HITCH LOCKING SYSTEM FIG. 3

standard trailer hitch 50mm	=20
hitch release handle	=21
ISO 50mm standard towball	=22
locking disc	=23
locknut	=24
threaded spindle (to suit boss)	=25

GEARBOX AND MOTOR DETAILS FIG. 4

motor	=3
gearbox	=4
brake	=26
square keys (2)	=27
allen screws m8*16 (2)	=28
worm	=29
gearwheel	=30
gearbox output shaft	=31

DRAWINGS KEY PAGE 2 OF 3

ADDITIONAL GEARING OPTION FIG 5

motor	=3
gearbox	=4
gearbox output shaft	=31
brake	=26
keys (3)	=27
screws (3)	=28
small pulley/sprocket	=32
large pulley/sprocket	=33
belt/chain	=34
axle	=35

TRACKED OPTION FIG. 6

motors (2)	=3
gearboxes (2)	=4
gearbox output shaft (2)	=31
brakes (2)	=26
track drive sprocket (2)	=36
endless drive track (2)	=37
track idler wheels (4)	=38
track base platten (2)	=40

ADAPTOR COLLAR FIG. 7

adaptor collar	=41
trailer hitch	=20
hitch locking handle	=21
50mm ball	=22
locking disc	=23
locknut	=24
threaded spindle	=25

REVERSE BRAKE BRACKET FIG. 8

bent bracket	=42
welded nut	=43
m12 threaded bar	=44
m12 locknut	=45
face bar	=46
plastic tube	=47
1" clearance hole	=63

DRAWINGS KEY PAGE 3 OF 3

MOTOR CONTROL CIRCUIT FIG. 9

HANDLE ASSEMBLY FIGS. 10 & 10A

plastic hand grip (2)	=48
allum handle (2)	=49
grub screw m6*8 (2)	=50
round tube handlebar(2)	=51
allum cross spindle	=52
on/off switch	=53
hand control cover plastic box	=54
slider centralising spring	=55
slider operating fork	=56
slider 10k log type	=57
spring retaining screw m4 csk	=58
main handle square tube	=59
handle mounting plate	=60
mounting holes 9mm (4)	=61
wiring loom 5 core	=62
spring stop	=63
slider mounting plate	=64
plastic box	=65
triangular handlebar gusset	=66
nylatron bushes	=67

HITCH MOUNTED ELECTRIC TOWING UNIT FIG. 11

ABS vacuum formed cover (2 piece)=10

CLAIMS

1. A hand operated towing unit for manoeuvring vehicle trailers, comprising a threaded ball locking system mounted on a means of drive, said driving means to be a motor, driving through a reduction gearing then connected to driven wheels or tracks.
2. A hand operated towing unit according to Claim 1, wherein the the ball locking means is provided for connecting to a hitch as found on trailers/caravans. such locking means comprise of a 50mm dia towball which is reduced to 70% of the standard height from the top and mounted on a threaded spindle which carries a locking disc which is female threaded and screws up or down. A threaded nut below acts as a locknut to provide an adjustment for various hitches and wear and tear.
3. A hand operated towing unit according to Claim 2 wherein the reduction gearing is variable by the interchanging of gears and/or pulleys and/or sprockets but preferably with a ratio of 66-1.
4. A hand operated towing unit according to Claim 3, wherein the drive means are preferably an electric motor.
5. A hand operated towing unit according to any preceding claims comprising an electronic circuit to control the drive means, such control circuit may be adapted to give a totally variable supply of power to the drive means, in both forward and reverse mode.

CLAIMS

6. A hand operated towing unit according to Claim 5 whereas the control means are activated by the twisting of a hand control as on a motorcycle but in both forward and reverse directions.

7. A hand operated towing unit according to Claim 6 further comprising a disc brake acting upon the drive motor and controlled through the control circuit whereas when the hand control is moved from the resting position the brake is released, conversely the brake is applied when the hand control is returned to rest.

8. A hand operated towing unit according to Claim 7 comprising a 'T' handle fixed to the chassis and carrying the hand controls. The on/off switch is mounted at the upper end and connected via the wiring loom to the control box. The handle to be the means of manoeuvring the unit.

9. A hand operated towing unit according to any previous claims incorporating a battery which will preferably be 12 volt semi-traction type and mounted on the chassis and connected to the control unit via positive and negative cables and providing the motive power to the drive means.

10. A hand operated towing unit according to Claim 9 and wherein a bracket is mounted between the locking disc and locknut and carries an adjustable bar which is threaded and includes a locknut, it will locate against the trailer 'A' frame.

CLAIMS

11. A hand operated towing unit according to Claim 10 comprising a collar, the bore to be clearance for the threaded spindle and the top face shaped to suit the lower face of non-standard hitches and to be mounted between the 50mm ball and the locking disc.
12. A hand operated towing unit according to Claim 11 whereas the drive means are duplicated and the transmission means are connected to drive tracks and/or wheels each drive means to be controlled independently for steering purposes.
13. A hand operated towing unit substantially as described herein with reference to figures 1 to 11 of the accompanying drawings.

Relevant Technical Fields

(i) UK Cl (Ed.M) B7D (DAWV, DAWX, DBA, DFBX)

(ii) Int Cl (Ed.5) B60S 9/16, 9/18

Search Examiner
M D WALKER

Date of completion of Search
11 MARCH 1994

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant
following a search in respect of
Claims :-
ALL

Categories of documents

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| X: Document indicating lack of novelty or of inventive step. | P: Document published on or after the declared priority date but before the filing date of the present application. |
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| A: Document indicating technological background and/or state of the art. | &: Member of the same patent family; corresponding document. |

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2229150 A1 (EUROTECH) - whole document	1-6,9
Y	GB 2229150 A1 (EUROTECH)	7,8
X	US 4210217 (LACHOWICZ) - Figures 1, 2	1 at least
X	US 3785960 (FELIZ) - whole document	1, 4, 5 at least
Y	US 3785960 (FELIZ)	7,8

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